

REMARKS

Applicant would like to thank the Examiner for the careful consideration given the subject application. The application has been carefully reviewed in light of the Office action, and amended as necessary to more clearly and particularly describe the subject matter which applicant regards as the invention.

Claims 1-7 are pending in the subject application upon entry of the amendments and the new claim. Claim 2 has been amended herein. Claim 7 has been added to further describe certain aspects of the invention. Favorable reconsideration in light of the amendments, the new claim, and the remarks which follow is respectfully requested.

Indefiniteness Rejection

Claims 2 and 5 stand rejected under 35 U.S.C. § 112, second paragraph. Claim 2 has been amended to more clearly describe certain aspects of the invention. Accordingly, withdrawal of the rejection is respectfully requested.

Obviousness Rejection of Claim 1

Claim 1 stands rejected under 35 U.S.C. §103(a) over Kushiya (US 5981868) in light of Eberspacher (US 5045409) and Basol (US 5028274).

One of the features of the claimed invention is that a light absorbing layer is formed by converting a precursor containing an In metal layer and a Cu-Ga alloy layer to the light absorbing layer *via* a first selenization step, a second selenization step, and a third selenization step. At the first selenization step, the precursor is pre-heated in an airtight space at a temperature in a range from a room temperature to 250°C. At the second selenization step, selenium is introduced into the precursor, and In, Cu, and Ga of the precursor are diffused in the precursor at a temperature in a range from 250° to 450°C. At the third selenization step, the precursor is recrystallized to form a light absorbing layer at a temperature in a range from 450° to 650°C.

To this end, claim 1 recites "*a first selenization step of accommodating a precursor-formed substrate in an airtight space and introducing hydrogen selenide gas into the airtight space conditioned to a temperature in a range from room*

temperature to 250 °C; a second selenization step of heating an interior of the airtight space to a temperature in a range from 250 ° to 450 °C and additionally introducing hydrogen selenide gas into the airtight space; a third selenization step of heating an interior of the airtight space to a temperature in a range from 450 ° to 650 °C, and performing heat treatment of the substrate under the above temperature conditions, while causing the hydrogen selenide gas introduced up to the second selenization step to remain in the space."

The Office action concedes on page 2 that Kushiya fails to teach or suggest selenization conditions as recited in claim 1. The Office action, however, contends on page 3 that Eberspacher teaches such features. From this, the Office action concludes that it would have been obvious to one skilled in the art to have heating the layers according to the method disclosed by Eberspacher in the method of Kushiya to arrive at the claimed selenization conditions.

It is respectfully submitted that Eberspacher fails to teach or suggest the claimed selenization conditions. In fact, Eberspacher teaches depositing "a film of copper 22, a film of indium 24 and **a film of selenium 26**" and, "[a]fter deposition of the materials," heating the three layers to form a copper indium diselenide (CIS) film 14 "in the presence of an **inert gas**" at temperatures from 350 °C to 550 °C. See column 3, lines 5-7, column 4, lines 8-15, and Fig. 2 of Eberspacher below. Eberspacher not only fails to teach or suggest selenization by using a hydrogen selenide gas, but Eberspacher in fact teaches away from the claimed selenization conditions.

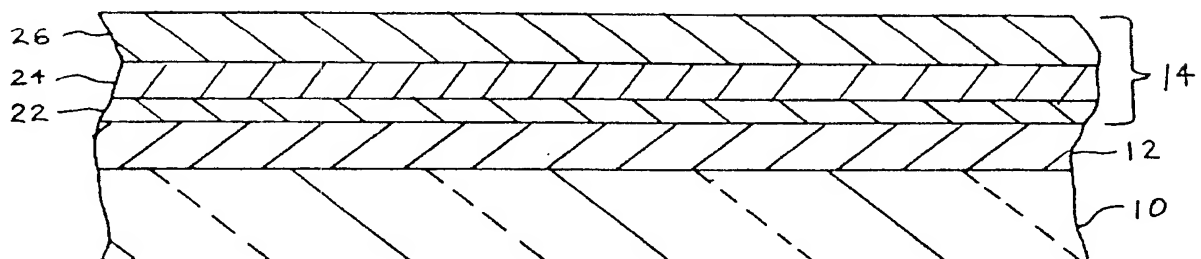


Fig. 2 of Eberspacher.

The Office action contends on page 3 that Basol teaches a deposition sequence of an indium layer and copper-gallium alloy layer. Basol, however, fails to make up for the aforementioned deficiencies of the combination of Kushiya and

Eberspacher. As a result, the combination Kushiya, Eberspacher, and Basol still fails to teach or suggest all the features of claim 1. Withdrawal of the rejection is therefore respectfully requested.

Obviousness Rejection of Claim 4

Claim 4 stands rejected under 35 U.S.C. §103(a) over Kushiya (US 5981868) in light of Eberspacher (US 5045409) and Basol (US 5028274).

Claim 4 recites *"a substrate is accommodated almost in an upright position in a cabinet rotatably disposed in an airtight space and the cabinet is rotated in at least one of the first, second, third selenization steps and the cooling step."*

The Office action concedes on page 3 that Kushiya fails to teach or suggest such features. The Office action, however, contends that "Hedstrom teaches a method of forming a chalcopyrite type solar cell wherein the substrate is positioned in a chamber on a rotatable device and wherein the substrate is rotated during selenization in order to ensure that the coating is uniform (3:61-68)."

It is respectfully submitted that Hedstrom relates to a physical vapor deposition of a CuInSe layer, which is different from and NOT equivalent to the claimed selenization. See column 1, line 11 and claim 1 of Hedstrom. In fact, Hedstrom teaches heating a selenium source 13, a copper source 14, and an indium source 15 in a chamber 12 and depositing the vaporized sources on a substrate 1 at the same time. See column 3, lines 38-42, lines 61-68, and Fig. 3 of Hedstrom below. Even assuming the teaching of Hedstrom is combined with the teaching of Kushiya, the proposed combination does not teach or suggest all the features of claim 3. This is because Hedstrom teaches a physical vapor deposition of a CuInSe layer, not selenization.

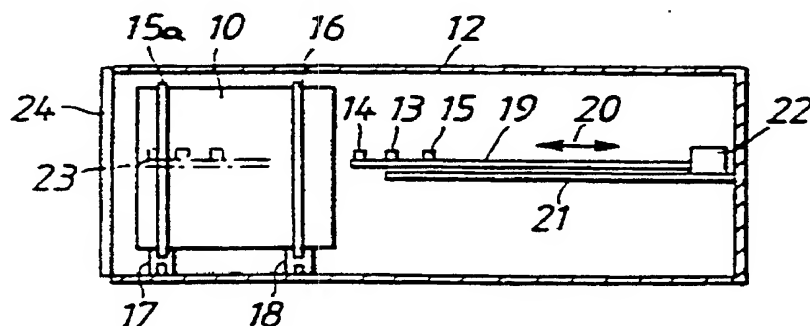


Fig. 3 of Hedstrom.

Since the combination of Kushiya, Eberspacher, Basol, and Hedstrom fails to teach or suggest all the features of claim 4, the combination cannot render claim 4 obvious. Withdrawal of the rejection is therefore respectfully requested.

In light of the foregoing, it is respectfully submitted that the subject application is in a condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in a condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the subject application.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 18-0160, our Order No. KOY-16877.

Respectfully submitted,
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